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IS 7247-5 (1985): Code of practice for fumigation of agricultural produce, Part 5: General requirements [FAD 16: Foodgrains, Starches and Ready to Eat Foods]

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(Reaffirmed - 2012)

# *Indian Standard*

## CODE OF PRACTICE FOR FUMIGATION OF AGRICULTURAL PRODUCE

### PART 5 GENERAL REQUIREMENTS

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INDIAN STANDARDS INSTITUTION  
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG  
NEW DELHI 110002

# Indian Standard

## CODE OF PRACTICE FOR FUMIGATION OF AGRICULTURAL PRODUCE

### PART 5 GENERAL REQUIREMENTS

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*Indian Standard*  
CODE OF PRACTICE FOR  
FUMIGATION OF AGRICULTURAL PRODUCE  
**PART 5 GENERAL REQUIREMENTS**

**0. FOREWORD**

**0.1** This Indian Standard ( Part 5 ) was adopted by the Indian Standards Institution on 31 January 1985, after the draft finalized by the Storage Structures and Storage Management Sectional Committee had been approved by the Agricultural and Food Products Division Council.

**0.2** The use of fumigants for the control of pests of agricultural importance is on increase in the country. Fumigants, being poisonous chemicals result in toxic manifestations to operators exposed to them during or after fumigation process, if handled carelessly. The fumigation operation can be made safer involving good practices leading to safe and economical use of fumigants and control of the infesting organisms.

**0.3** This standard ( Part 5 ) is one of the series of Indian Standards on Code of practice for fumigation of agricultural produce. The other parts published in this series are:

Part 1 Methyl bromide

Part 2 Ethylene dibromide

Part 3 Aluminium phosphide

Part 4 Ethylene dichloride and carbon tetrachloride mixture

These parts ( Parts 1 to 4 ), cover the selection, safety and suitable application techniques of individual fumigants.

**0.4** During the preparation of this standard ( Part 5 ), guidance has been taken from AS : 2476-1981 'General fumigation procedures', issued by the Standards Association of Australia.

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**1. SCOPE**

**1.1** This standard ( Part 5 ) lays down the general procedures and precautions to be adopted when chemical fumigation for the eradication of storage pests is being carried out.

**1.1.1** This standard also recommends the general principles for the use of gases and vapours for the fumigation of buildings, ships' holds, shipping containers, silos, materials under sheeting, and soil. The standard should, however, be used in conjunction with a specific code of instructions or State requirements, applicable to the particular fumigation being carried out, where this is available.

## 2. TERMINOLOGY

**2.1** For the purpose of this standard the following definitions in addition to those given in IS : 6151 ( Part 1 )-1967\* shall apply.

**2.2 Fumigant**—A chemical which at ambient temperature and pressure can exist in a gaseous state in sufficient concentration and penetrability and for sufficient time to be lethal to storage pests.

**2.3 Fumigation**—The process of employment of fumigants for disinfection.

**2.4 Fumigation Enclosure**—Any space which has been or is intended to be made gas tight to contain the fumigant.

**2.5 Risk Area**—The area surrounding the fumigation enclosure into which there is any reason to suspect that the fumigant may escape in concentrations hazardous to man and animals.

**2.6 Authorized Fumigator**—That person who is licensed to carry out fumigation, or a trained and experienced person who is in charge of the fumigation.

NOTE—For the purpose of this standard, the term 'fumigator' is taken to mean an authorized fumigator, as defined above.

## 3. SAFETY

### 3.1 Safety Equipment

**3.1.1 Full Face Canister Type Respirator**—The respirator most commonly used is the full face canister respirator used as a combination of respirator facepiece and correct canister, in accordance with IS : 8523-1977†. This apparatus is the most important piece of equipment used for the protection of persons working with fumigants. It is advisable that each operator be supplied with his own respirator and that the fumigator in charge be responsible for its care and maintenance.

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\*Storage management code: Part 1 Terminology.

†Respirators, canister type (gas masks).

**3.1.1.1** Each time a full face canister respirator is donned, the following checks should be carried out:

- a) That the correct canister is being used;
- b) That the facepiece is the correct fit, by closing the inlet to the canister with the palm of the hand and inhaling deeply; the vacuum so created should cause the facepiece to adhere to the face for at least 15 seconds;
- c) That the shelf life of the canister has not expired (*see 6.2*); and
- d) By reference to the canister log, that the recommended usage time has not been exceeded (*see 6.2*).

**NOTE** — In no circumstances should a full face canister respirator be used when there is a possibility of exposure to fumigation concentrations or to an atmosphere deficient in oxygen. In such cases self-contained breathing apparatus should be used.

**3.1.2 Self-contained Breathing Apparatus** — For emergency use where an operator must enter a fumigant-filled area, a self-contained breathing unit or apparatus complying with IS : 8523-1977\* shall be worn.

**3.1.3 Protective Clothing** — All operators when releasing fumigant shall wear protective clothing. Impervious gloves and impervious footwear should, where applicable, be worn.

**NOTE** — Impervious is taken here to mean impermeable to the relevant fumigant gas, under the conditions of use. Only products known by the fumigator to comply with this requirement should be used.

**3.1.4 Safety Harness and Ropes** — When any fumigator is required to enter a basement or the hold of a ship or other such area for the purpose of applying fumigant or for rescue purposes, he shall wear a safety harness to which is attached a rope by which he can be hauled up. All safety harness and lifelines shall comply with IS : 3521-1965†.

**3.1.5 Detection Equipment** — The correct detection equipment for the fumigant being used shall be available on every fumigation and shall be kept in efficient working order, for example, halide lamp or detector tubes.

**3.1.6 Torch** — An efficient torch shall be available on all fumigations, certified by a recognized testing authority as safe for use in an atmosphere made flammable by the fumigant or any other material such as dust.

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\*Respirators, canister type (gas masks).

†Lineman's leather safety belt and strap.

**3.1.7 Medical Kit** — A kit for the treatment of fumigant poisoning shall be available at each fumigation done.

NOTE — Advice on this kit may be obtained from the appropriate State department of health or department responsible for industrial regulations.

## **3.2 First Aid Instructions**

**3.2.1 Entering Contaminated Area** — Adequate protective equipment shall be used when a contaminated area is to be entered for rescue purpose.

**3.2.2 Evacuation of Succumbed Person** — A succumbed person shall be removed to fresh air, laid down in a restful position and kept warm.

**3.2.3 First Aid Treatment** — When an accident occurs, first aid treatment shall be started at once. If possible, one person should begin treatment while another calls a doctor and ambulance giving details of fumigant and circumstances of exposure.

**3.2.4 Measures to be Taken While Awaiting Arrival of Medical Aid** — Where practicable, the following measures shall be carried out while awaiting the arrival of medical aid:

- a) Apply artificial resuscitation and external cardiac massage, if required;
- b) Loosen all tight clothing;
- c) Remove contaminated clothing including wrist watch and spectacles;
- d) Thoroughly wash contaminated skin with clean water; and
- e) Eye contamination:
  - i) Hold eyelids open and wash eyes immediately with a gentle flow of water;
  - ii) Continue washing until doctor arrives; and
  - iii) Do not use any chemicals, as they may increase the injury.

## **4. ACTION BEFORE FUMIGATION**

### **4.1 Notification of Authorities and Persons Concerned**

**4.1.1 Fumigation of a Building or Enclosed Space** — A fumigator intending to fumigate a building or other enclosed space shall intimate to the occupant about the intention of fumigation.

**4.1.2 Fumigation of a Vessel** — The fumigator in charge, when intending to fumigate a vessel, shall deliver a notice in writing prior to the fumigation about the intention of fumigation.

**4.2 Fumigation Warning Signs** — The fumigator in charge of fumigation on any building, vessel or enclosed space shall, before the application of the fumigant, affix to each door and other means of access to the fumigation enclosure a notice in the form of Schedule 1 (see Appendix A) with a white background on which there shall be printed the words 'DANGER KEEP OUT', followed by the words 'FUMIGATION BY.....( name of fumigant)' in capital letters not less than 10 cm high, in contrasting colour to the background. The fumigator's name and telephone number should be clearly shown at the foot of the notice. All warning notices shall be suitably illuminated.

**4.3 Precautions and Tests of Equipment** — No person shall commence a fumigation until the following conditions apply:

- a) The fumigator has by personal inspection ascertained that all portions of the fumigation enclosure and risk area have been vacated.
- b) All fires and naked lights within the fumigation enclosure have been extinguished. For flammable fumigants there should be no smoking or carrying of matches and cigarette lighters in the risk area.
- c) All electric points have been thoroughly checked ascertaining that there is no spark while operating the points/buttons. All loose connections have been properly repaired.
- d) Fans as required are in position and tested for efficiency. For flammable fumigants, it is essential that fans and their switches, if any, used within the fumigation enclosure comply with the requirements of hazardous locations.
- e) All cracks, crevices or openings in or between walls and ceilings or roof and floors and all fireplaces in the building, vessel, or other enclosed space about to be fumigated have been sealed to prevent the escape of fumigant from the fumigation enclosure.
- f) All liquids, foods and other items that are not required to be included in the fumigation and might be affected by the fumigant are separated from the fumigation enclosure.
- g) In case of open area, fumigation shall be carried out either early morning or when there is no wind blowing, that is, in calm atmosphere.

- h) Fumigator has attached a card to his shirt indicating his name, full address and telephone number, required in case of emergency.
- j) The nearest operable telephone has been located and number noted.
- k) Fumigator has consulted individual standards on fumigants (*see also 0.3*).

## 5. FUMIGATION PROCEDURE

**5.1 Fumigation Process** — The efficacy of all fumigants is dependent upon a suitable concentration and duration of fumigation. The instructions for the particular fumigant, volume of fumigation space, goods to be fumigated and pest to be controlled should be followed. The instructions should be consulted before hand and followed in detail. Under no circumstance shall be fumigant concentration be grossly different from the recommended concentration which is based upon scientific experiment.

**5.2 Minimum Number of People to Conduct a Fumigation** — No matter how small the dosage or how restricted the extent of the fumigation, at least two persons shall always be present during the introduction and removal of the fumigant. One of these should be designated the fumigator and he should ensure that the other fumigation staff receives instructions on the use of protective equipment and first aid measures specific to the fumigation being conducted.

**5.3 Ventilation** — Provision for ventilation should be made during the preparation of structures for fumigation. Where possible, two openings to facilitate flow-through ventilation should be provided with temporary seals that can be removed from the outside of the fumigation enclosure at the completion of fumigation. Doors, windows or hatches selected for this purpose should be arranged so that they may be opened from the outside of the fumigation enclosure. Where fans are used, these should comply with the requirements of 4.3 (d). Generally fans should be operated intermittently to allow for desorption of fumigant from commodities. Where fans are run continuously, no reduction in the nominal ventilation period should be made.

**5.4 Introduction of Fumigant** — Fumigants should be introduced to the fumigation enclosure in accordance with specific fumigation instructions and safety measures, taking care to ensure that all application equipment is gas tight and that the correct dosage is applied.

**5.4.1** The fumigant should be introduced from outside the fumigation enclosure wherever possible.

**5.4.2** Whenever a safety harness is required to be worn (*see 3.1.4*), at least one other member of the fumigation staff shall remain in the immediate vicinity and in clear sight of the operator. Adequate provision shall be made to haul out the operator in an emergency.

**5.4.3** The fumigant shall not be applied in a manner as to be absorbed in liquid form by goods or structures.

**5.4.4** During the liberation of the fumigant and until the fumigation enclosure and risk area are free from danger, any member of the fumigation staff who is in or who enters any part of such areas shall wear a suitable respirator or other approved breathing apparatus. He should wear protective clothing also.

**5.5 Watchman** — Where the fumigation enclosure and risk area cannot be satisfactorily secured by locking, a watchman shall be on duty. It is recommended that, even on locked premises, a watchman should be present during the exposure period.

**5.6 Detection of Leaks** — During and after completion of introduction of the fumigant, the fumigator, wearing a respirator, shall inspect visually, and with appropriate detection apparatus, for leaks in equipment and in the fumigation enclosure. The following action should be taken if leaks are detected:

- a) Seal and re-test any leaks located, to ensure that the fumigation enclosure is gas tight; and
- b) In the event of a massive accidental release of fumigant, evacuate the risk area immediately.

**5.7 Removal of Fumigant** — At the end of the required fumigation period, the fumigant should be removed by controlled release into the atmosphere, ensuring that the following conditions are complied with:

- a) That the risk area is free from all unauthorized persons;
- b) That the fumigation team is properly equipped for fumigation; and
- c) That ventilation of the fumigation enclosure is done by mechanical means, where available; where mechanical ventilation is not available, that the enclosure is unsealed in sections to allow gradual release of the fumigant. Where natural ventilation is insufficient for rapid clearing of the gas, fans may be utilized, but operators should retire from the risk area for at least 30 minutes immediately after switching on the fans.

**5.8 Checking for Clearance** — The risk area shall be checked for clearance of the fumigant as follows:

- a) The fumigation team shall be properly equipped in accordance with 3 and, after a sufficient period of ventilation, shall check the concentration of fumigant in the risk area and, if it is acceptably low, should proceed to check the fumigation enclosure; and
- b) Upon excessively high concentration of fumigant being detected, the fumigation team shall retire, wait a further period of time and recommence the check procedure until all sections of the fumigation enclosure have been proved safe for re-entry.

## **6. ACTION AFTER FUMIGATION**

**6.1 Re-entry into the Fumigation Area** — When the fumigant concentrations in the fumigation enclosure and risk area have fallen to a safe working level, operators may re-enter the areas to remove fumigation equipment.

**6.2 Use and Care of Respirator Canister** — The respirator canister shall always be replaced before either its shelf life has expired or the recommended usage time has been reached. The expiry date of a canister may easily be calculated since each is marked with the date of manufacture and shelf life.

**6.3 Canisters** should be stored in a cool, dry, well ventilated place away from contamination by any fumigants. The following precautions shall always be observed:

- a) When the canister is attached to the respirator facepiece after the top seal is removed, record the date. This is best done by writing the date on a small adhesive label which must be affixed to the canister. This label can be used as a 'log' to record exposure of the canister to the fumigant.
- b) Before using the respirator, remove the cap and the seal over the air inlet valve of the canister. Again, at this time mark the date on the 'log' label. Once this seal is removed, even if there is no exposure to fumigant, replace the canister after a lapse of 6 months.
- c) After any fumigation in which there has been prolonged exposure to low concentrations of the fumigant or accidental exposure to high concentrations, immediately discard the canister. As a guide, one hour of wearing is the usual period after

which a canister should be discarded. This could be extended to two hours only when exposure is minimal. Allow a wide margin of safety in estimating exposure times as canisters cost little in terms of health of the individual. If there is any doubt about the exposure life of the canister, discard it.

- d) When canisters are discarded, they should be rendered unusable by mutilating the inlet port and disposed of under conditions which will prevent them from being picked up and used again.
- e) Canisters that show any sign of external damage must be considered worthless, and shall be discarded. A severe blow on the metal covering may cause displacement of the contents, permitting contaminated air to pass through to the wearer.

NOTE — Immersion of the canister in water renders it useless. Water may enter the canister through the facepiece. Disconnect the hose and canister when cleaning or disinfecting the facepiece.

**6.4 Fumigation Records** — Every person in charge of a fumigation shall keep a record of the fumigation which shall include details of the following:

- a) Address of fumigation enclosure,
- b) Fumigant used and dosage,
- c) Fumigation commencing date and time,
- d) Fumigation clearance date and time,
- e) Copies of all notices submitted, and
- f) Results of fumigation.

This information should be retained for examination by the concerned authorities on demand.

**APPENDIX A**  
**( Clause 4.2 )**

**FUMIGATION WARNING NOTICE**

**SCHEDEULE**

**DANGER**

**KFEP OUT**

**POISON GAS SYMBOL,**  
in accordance with IS : 1260 ( Part 1 )-1973\*.

**FUMIGATION BY**

Authorized Fumigator

Telephone No.

Affix Flammable Label, if applicable,  
in accordance with IS : 1260 ( Part 1 )-1973\*.

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\*Pictorial markings for handling and labelling of goods; Part 1 Dangerous goods  
(*first revision*)

(Continued from page 2)

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# INTERNATIONAL SYSTEM OF UNITS (SI UNITS)

## Base Units

QUANTITY	UNIT	SYMBOL
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Luminous intensity	candela	cd
Amount of substance	mole	mol

## Supplementary Units

QUANTITY	UNIT	SYMBOL
Plane angle	radian	rad
Solid angle	steradian	sr

## Derived Units

QUANTITY	UNIT	SYMBOL	DEFINITION
Force	newton	N	1 N = 1 kg.m/s <sup>2</sup>
Energy	joule	J	1 J = 1 N.m
Power	watt	W	1 W = 1 J/s
Flux	weber	Wb	1 Wb = 1 V.s
Flux density	tesla	T	1 T = 1 Wb/m <sup>2</sup>
Frequency	hertz	Hz	1 Hz = 1 c/s (s <sup>-1</sup> )
Electric conductance	siemens	S	1 S = 1 A/V
Electromotive force	volt	V	1 V = 1 W/A
Pressure, stress,	pascal	Pa	1 Pa = 1 N/m <sup>2</sup>